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(54) Title: ANTIMICROBIAL COMPOSITION

(57) Abstract

The invention relates to a composition having antimicrobial and hygroscopic properties comprising carboxylic acids having up to 10 carbon atoms and the salts thereof as well as C_3-C_{10}-diols as a mixture, or as a chemical compound in the form of an ester, polyester or polymer for cleaning, disinfecting, surface treatment, impregnation and for antimicrobial treatment.

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ANTIMICROBIAL COMPOSITION

The invention relates to the use of a composition having antimicrobial and hygroscopic properties comprising carboxylic acids or salts thereof, having up to 10 carbon atoms and C_3-C_{10}-diols as a mixture, or as a chemical compound in the form of an ester, polyester or polymer for cleansing, disinfection, surface treatment, impregnation and for antimicrobial treatment.

Background of the invention

From T. Kinnunen et al., Acta Derm. Venereol (Stockholm 1991) vol. 71:148-150 it is known that diols (glycols) have antimicrobial effect against both fungi and bacteria in vitro. According to Kinnunen 10-30 % hexylene glycol showed antimicrobial effect within 20 hours, 5 % hexylene glycol a certain antimicrobial ffect, while 1 % of the agent lacked effect. On comparison 30 % butylene glycol and 30 % propylene glycol were about as effective as 10 % hexylene glycol. Diols occur as solvents in various dermatological vehicles since then they are atoxic to skin epithelium. Propylene gycol is a commonly occurring solvent in dermatolological vehicles. However, also diols having longer carbon chains, such as, for example, butylene glycol and hexylene glycol have recently started to be used in vehicles instead of propylene glycol, mainly due to their stronger antimicrobial properties.

Furthermore, diols may be used as antifreeze agents, as is well known.

Furthermore, propylene glycol in a 50 % aqueous solution was shown to be effective against one skin disease, Pityriasis versicolor, caused by the yeast fungi Pityrosporum ovale (cf. Jan Faergemann, Acta Dermatovener (Stockholm) 60:92-93, 1980). Robertson et al., has in J. Infect. Dis. 83:124-137, 1948, examined the bactericidal ffect of i.a. glycol vapours and lactic acid on airborne organisms and illustrates also in his study that lactic acid is the most air-sterilizing of the tested

compounds. It is, however, pointed out on page 136, left column, that lactic acid is not a suitable substance. Neither is there in any of the references any information which would lead a person skilled in the art to draw the conclusion that a combination of carboxylic acid having up to 10 carbon atoms and C_3-C_{10}-diols have a synergistic acting antimicrobial effect or effect both on fungi organisms and bacteria.

In Current Therapeutic Research (43:547-551, 1988) Faergamann compares the antimicrobial effect of two diols, propane-1,2-diol and 2-methyl-2,4-pentanediol, and describes the advantages of these diols when added to a skin cream. However, nothing is mentioned about a combination of carboxylic acids or that such a combination could give even lower MIC-values and improved treatment results. Despite the statement that these two diols may serve as a preservative it is stated on page 550 that alclometasone dipropionate cream and Essex cream contain a preservative, i.e. chlorocresol, which is known to cause allergic reactions.

The Swedish patent No. 464 060 relates to the use of pentane diol or hexane diol for preparing an agent for treating infections caused by the herpes virus.

The Swedish patent application No. 8802257-9 relates to the use of a composition containing aluminium acetotartrate (alsol solution) and a diol having antimicrobial properties for preparing an agent aimed at reducing skin irritation, particularly in the nappy region. Furthermore, it has been reported that the killing of microorganisms is potentialized by the combination propylene glycol and aluminium acetotartrate.

In EP 0 292 495 a diol is described (propylene glycol), which in combination with urea shows an unexpected good effect in the treatment of hyperkeratotic skin diseases and onychomycosis. Lactic acid may in this patent be included as an additive having

acidifying properties, which also gives cosmetic advantages when used together with urea.

It is previously known that lactic acid (Acidum lacticum) has hygroscopic and acidifying properties and is included, i.a. in foodstuffs, skin preparations and soap products.

WO 89/00853 relates to a treatment agent containing salicylic acid in combination with aliphatic 1,2-diol and fatty acid esters for local therapy for flaking skin diseases in human and veterinary medicine. Salicylic acid has well known anti-flaking properties.

WO 94/09755 discloses the use of salicylic acid in combination with propylene glycol for the treatment of flaking skin diseases, such as, eczema and psoriasis. However, salicylic acid is not included in the present invention.

It is previously known that certain carboxylic acids can have antiviral properties in vitro against respiratory virus (DE 3227126) as well as herpesvirus, orthomyxovirus and rhabdovirus (G. Poli et al "Virucidal activity of organic acids", Food Chemistry, vol. 4, No. 4, 1979, pages 251-257). It is also known that certain carboxylic acids, for example propionic acid have antimycotic effects and some other carboxylic acids, such as lactic acid have known antibacterial effects (The Extra Pharmacopoeia, W. Martindale, London, 1977, 27th Ed., pages 651-652 and 738-744, 1275-1276.

GB, A1 155 796 discloses the use of alkyl lactate in combination with alkylene glycol as a solvent for the treatment of acne. Certain carboxylic acids are used as buffers to adjust pH and prevent hydrolysis. Also GB, A1 1 388 836 and EP 0 150 914 discloses the use of alkyl lactate in combination with alkylene glycol (propylene glycol for example) as a solvent for the treatment of acne.

Also Chemical Abstract, vol. 108 (1988), abstract No. 62508 IN, A, 157171 is relating to treatment of acne, viz. a specific skin disease.

According to EP A2 0 241779 organic acids are used to dissolve iron oxide together with sorbitol as a surfactant. In certain cases sorbitol can be replaced by glycols.

According to Chemical Abstracts, Vol. 113 (1990) abst. No. 8476, JP, A2, 0 2047200 warm baking trays are cleaned mechanically with caboxylic acids and glycols.

DE, C1 4311713 discloses the use of citric acid or tartaric acid dissolved in propylene glycol or polyethylene glycol. The composition is used on glass or plexiglass surfaces in shower cabinets where the acid has the role of dissolving deposits of lime and the glycol to give a sufficient viscosity so that the composition stays in place for the time it takes for the acid to work. Carboxylic acids have a similar function, in DE, A1 3042507 for the purpose of cleaning surfaces on enamelled goods. Additives of hygroscopically active diols may also be included.

EP 0 033 111 relates to a combination of organic acid and alcohol to mechanically loosen deposits of lime, oil and fat on the interior surface of dishwashers.

It is known that many antimicrobial substances presently used may cause side effects such as, for example, allergies, and are therefore unsuitable for use e.g. in skin preparations.

Cleaning agents of today, such as washing-up liquid, soap etc., which are often characterised by a basic pH-value, are easily contaminated and, furthermore, are hardly kind to the skin. Various additives often mean that the cleaning agents are no long r either environmentally kind or kind to the skin and thus are not readily accepted by the consumer.

Neither is there currently a suitable agent for cleaning skin, leather, plastic, metal and wooden surfaces.

The agents of today used for cleaning surfaces of biological material often contain ethyl alcohol and isopropanol, which appear to be desiccating.

Peeling agents sometimes contain abrasives which may cause sores on the skin, which secondarily may act as an approach for bacteria, therefor an effective antimicrobial agent kind to the skin having peeling effect without harmful additives would fulfill a long sought after need.

Another current problem is that impregnation agents and antimicrobial additives to paint are often toxic, highly allergenic and are not environmentally friendly.

The forming of mould is also a great problem in the handling of wood and in waste paper recycling.

The medical care of today lacks also a user-kind agent having effect on microbes on the skin and for the diseases caused by this. Antibiotic additives in skin preparations may cause resistance and allergy problems.

The cited technique relates i.a. to different forms of mechanical cleaning where, for example, deposits of lime and iron oxide are dissolved by carboxylic acids. The present invention relates, however, to an antimicrobial and hygroscopic activating composition. The synergistic active antimicrobial properties of the active components according to the invention in the stated areas of use are, thus, not previously described.

Thus, for a long time there has been a need for an environmentally friendly, low allergenic, kind-to-the-skin and non-dangerous preparation having hygroscopical and antimicrobial acting properties, which may be used for widely different areas

such as for cleansing, disinfection, surface treatment and impregnation or for producing biologically decomposable materials.

Description of the invention

Said problems are solved according to the invention by the use of a composition containing carboxylic acids or salts thereof having up to 10 carbon atoms and C_3-C_{10}-diols which give an increased antimicrobial effect and a wide antimicrobial spectrum having great inhibitory effect on several Dermatophytes, yeast fungi, mould fungi, bacteria and virus. The composition is furthermore kind to the skin, environmentally kind, low allergenic, keratolytic active and has also a hygroscopic effect and does not evaporate as fast as e.g. ethanol. From the research carried out by the inventor in developing the invention an increased antimicrobial effect was obtained by a combination of diols and carboxylic acids according to the invention in tests on different microorganisms. Preferably C_3-C_6-diols were used.

Examples of C_3-C_{10}-diols which may be used according to the invention are propylene glycol; butylene glycol; pentanediol, hexylene glycol, heptanediol, octanediol, nonanediol, decanediol.

The term carboxylic acids having up to 10 carbon atoms, which may be used according to the invention, relates to saturated and unsaturated, straight and branched aliphatic mono-, di- and polycarboxylic acids having up to 10 carbon atoms, araliphatic and aromatic dicarboxylic acids, oxy and hydroxy carboxylic acids having up to 8 carbon atoms. Examples hereof are formic acid, acetic acid, propionic acid, butyric acid, valeric acid, caproic acid, caprylic acid, capric acid, sorbic acid, oxalic acid, malonic acid, fumaric acid, succinic acid, glutaric acid, adipic acid, pimelic acid, oxalacetic acid, phtalic acid, glycolic acid, citric acid, lactic acid, glucuronic acid, glyceric acid, malic acid, tartaric acid, tartronic acid, hydroxibutyric acid, hydroxipropionic acid and pyruvic acid.

The combination which is used according to the invention may be a mixture or a chemical composition in the form of an ester, a polyester or a polymer.

A chemical composition has the advantage over a mixture in that it is relatively stable and is not so easily leached with water, if, for example it is used for the purpose of impregnating. Since the chemical composition is biologically decomposable small amounts of carboxylic acid and diol may slowly be released, whereby the material maintains its antimicrobial effect during a significantly longer time. A bond between carboxylic acids and diols may be made more or less stable so that sufficiently large amounts of the decomposable products diol and carboxylic acid are released for adaptation for various purposes.

A chemical fixing of the carboxylic acids and diols may be achieved with the aid of polyester bonds or longer chains of diol and carboxylic acid together, so called polymers. A polymer of only lactic acid, so called polylactides, are used today for producing "non-woven" material, which, i.a. may be used for nappies, sutures and packing material. For these areas of use the possible antimicrobial effect of a material is of great importance.

A chemical compound of diol and carboxylic acid has similar areas of use, i.e. in the production of nappies, dressings, sanitary products, sutures and packing materials, and also as an additive for wood and paper products.

The composition according to the invention may contain additives such as water, C_1-C_8-alcohols, oils preferably vegetable oils such as peanut oil, olive oil, rape seed oil, linseed oil, tall oil and castor oil with or without being combined with emulsifying agents. Also surfactants may be added to strengthen the cleansing effects. Ur a and/or polyethylene glycol may also be included. Other additives may be antimycotics, preferably azole derivatives, allyl amines and amorolfine; antiviral agents, preferable

idoxyuridine, acyclovir, phosphonio formic acid, podophyllotoxin; antibacterial agents such as biguanides and amidines, quinolines, benzoyl peroxide, bibrocatole, clindamycin, neomycin, fucidinic acid, mupirocin, sulphur; glucocorticoides, preferably hydrocortisone and flouro substituted steroids, gels and enzymes.

According to the invention a composition is used comprising carboxylic acids or salts thereof, as defined above, and C_3-C_{10}-diols in products for cleansing, disinfection or antimicrobial effect, surface treatment and impregnating or for the production of biologically decomposable material. The invention comprises also mixtures of several carboxylic acids and diols where diols having shorter carbon chains serve as solvents for diols having longer carbon chains.

The included amounts of carboxylic acid when in use according to the invention constitute 0.1-60 percent by weight and C_3-C_{10}-diol constitute 0.1-99.9 percent by weight.

According to a preferred embodiment of the invention 0.1-40 percent by weight carboxylic acid and 0.15-91 percent by weight diol is used.

According to an especially preferred embodiment of the invention 0.12-40 percent by weight acetic acid, citric acid, tartaric acid, lactic acid and 0.38-91 percent by weight propylene glycol, butylene glycol, pentanediol and hexylene glycol is used, wherein one or several carboxylic acids and diols may be included.

The minimal inhibitory concentration (MIC) for propylene glycol (100%) tested on the bacterium Staphylococcus aureus and the dermophyte Tricophyton rubrum dropped from 8 % to 0.15 % and 0.38 % respectively if lactic acid was mixed with propylene glycol in the ratios 3:10 or 2:3. The composition gave a minimal inhibitory effect at concentration 0.25% and 0.5 % resp ctively. These MIC-values should be compared with the considerably higher MIC-values of 40 %, which were obtain d when propylene glycol at

20 % was combined with aluminium acetotartrate (SE 8802257-9). Optimum antibacterial effect was achieved in our own studies if the ratio between lactic acid and propylene glycol was 3:10, 3:7 or 2:3 dependent upon the type of microorganism. Also other concentration ratios gave stronger but not optimum effect. The antimicrobial effects were not proportionate to the degree of acidity (pH).

In a challenge test carried out according to the Apoteksbolaget's standard, where an inoculate of different microorganisms were added, a result was achieved closely comparable to disinfecting agents. Challenge testing was conducted with a varied concentration of bacteria 3 x 10^5/ml, 5 x 10^5/ml and 7 x 10^5/ml. A complete and lasting inhibition (<1/ml) of three bacteria strains (Staphylococcus aureus, Escherichia coli and Pseudomonas) occurred already after 1 hour if an aqueous solution of merely 5 % lactic acid combined with 16 % propenylene glycol was used as test substance. When loaded with the mould fungus Aspergillus niger (2,2 x 10^4/ml) and the yeast fungus Candida albicans (2,9 x 10^5/ml) in the same test, the number of viable microorganisms/ml was <1 at a 48 hour reading. A logarithmic reduction of viable yeast fungi (Candida albicans) occurred after one hour from 2,9 x 10^5/ml to 7,3 x 10^1/ml.

A determination of the minimum inhibitory concentration (MIC) was carried out for different compositions of acid/glycol on different microorganisms. Method description and the result are given below.

Method description MIC-plate

The components included in the composition were weighed with decimal precision. A dilution series in sterile destilled water was made where the completed composition is dilution 1. Dilution 2 is 50 % of the composition, dilution 3 is 25 % etc. One thus gets a series of 100 - 50 - 25 - 12.5 - 6.3 - 3.1 - 1.6 - 0.8 - 0.4 - 0.2 - 0.1%. To said dilutions the same amount (volume) of Oxoids Isosensitest agar was added at 62.4 g medium per litre.

The Isosensitest agar is prepared and sterilized according to the maker's instructions. One then gets ready-to-use MIC-mixtures having 31.2 g Isosensitest medium per litre mixture and composition concentrations of 50 %, 25 % etc. down to 0.05 %. Furthermore a plate without the composition was prepared, called a blanc plate. From the different mixtures MIC-plates are moulded in sterile Petri dishes. From each agent a suspension was made corresponding to MacFarland 1. From this 0.2 ml was added to each MIC-plate and the blanc plate with a pipette. The MIC-plates were incubated in a thermostat having an optimum temperature for the agent. The MIC-value is the concentration of the composition on the MIC-plate where growth has stopped completely.
Example. Agent 1 grows in 0.1 %, 0.2 %, 0.4 %, On the 0.8 %-plate the growth is weak but visible. The MIC-value for agent 1 is then 1.6 %.

MIC-determination of various compositions of acid/glycol
pH in th various MIC plates

Composition MIC-plate	1	2	3	4	5	6	7	8	9
0	7	7	7	7	7	7	7	7	7
0.05	7	7	7	6.9	6.9	6.9	5.0	5.7	5.4
0.1	7	7	7	6.7	6.6	6.5	4.3	5.5	5.2
0.2	7	7	7	6.6	6.4	6.3	4.2	5.5	4.9
0.4	7	7	7	6.3	5.6	5.6	3.9	5.3	4.6
0.8	7	7	7	5.3	4.1	4.6	3.9	5.1	4.2
1.6	7	7	7	4.8	4.1	4.4	4.0	4.6	4.1
3.1	7	7	7	4.2	3.8	4.0	4.0	4.3	3.6
6.3	7	7	7	3.8	3.5	3.6	3.9	3.6	3.3
12.5	7	7	7	3.5	3.2	3.3	3.6	3.1	2.6
25	7	7	7	3.2	3.6	3.1	3.5	3.0	2.1
50	7	7	7	3.1	2.7	2.9	3.4	2.7	2.0

MIC-value for various agents

Composition Agent	1	2	3	4	5	6	7	8	9
A1	12.5	12.5	6.3	12.5	12.5	6.3	0.4	12.5	12.5
A2	12.5	12.5	6.3	12.5	12.5	6.3	0.2	12.5	12.5
B1	50	25	25	3.1	3.1	1.6	25	25	25
B2	50	25	25	3.1	1.5	3.1	25	25	50
C1	6.3	6.3	0.8	1.6	0.8	0.8	<0.05	0.4	0.4
C2	6.3	6.3	0.8	1.6	0.8	0.8	<0.05	0.4	0.4
D1	12.5	12.6	6.3	12.5	12.5	6.3	0.4	12.5	25
D2	12.5	12.6	6.3	12.5	12.5	6.3	0.4	12.5	25
E1	25	25	12.5	3.1	1.6	1.6	0.1	1.6	0.4
E2	25.5	25	12.5	3.1	1.6	1.6	0.1	1.6	0.4
F1	12.5	12.5	12.5	1.6	1.6	1.6	1.6	3.1	3.1
F2	12.5	12.5	12.5	1.6	1.6	1.6	1.6	3.1	3.1
G1	12.5	3.1	1.6	0.8	0.4	0.4	<0.05	0.2	0.2
G2	6.3	1.6	3.1	0.8	0.4	0.4	<0.05	0.2	0.2

A1 and A2	Candica albicans	Clinical isolate
B1	Malassezia furfur	Pityrosporum ovale
B2	Pityrosporum orbiculare	Pityrosporum ovale
C1 and C2	Trichophyton rubrum	Clinical isolate
D1 and D2	Aspergillus niger	Clinical isolate
E1 and E2	Staphylococcus aureus	Clinical isolate
F1 and F2	Streptococcus pyogenes	Clinical isolate
G1 and G2	Pseudomonas aeruginosa	Clinical isolate

COMPOSITION

1 Propylene glycol	100 %
2 Butylene glycol	100 %
3 Hexylene glycol	100 %
4 Lactic acid/propylene glycol	30/70 %
5 Lactic acid/butylene glycol	30/70 %
6 Lactic acid/hexylene glycol	30/70 %
7 Acetic acid/propylene glycol	30/70 %
8 Citric acid/propylene glycol	30/70 %
9 Tartaric acid/propylene glycol	30/70 %

Hexylen glycol = 2-methyl-2,4-pentane diol
Butylene glycol = 1,3-butane diol
Propylene glycol = 1,2-propan diol

Cosmetic and medical cleansing agents

The composition which is used according to the invention cleanses the skin due to the hygroscopic and antimicrobial properties and also because of the prominent peeling properties.

The composition according to the invention may also be used for preparing an agent having effect against such microorganisms which attack the skin and diseases caused by said microorganisms. Foremost, the composition according to the invention is effective against Candida, Pityrosporum, Trichophyton, Microsporum, mould fungi especially Aspergillus, Staphylococcus, Pseudomonas, and viruses, especially herpes virus, hepatitis virus, wart virus and HIV-virus.

Examples of diseases where these antimicrobial compositions show effectiveness are eczema, in particular seborrhoeic eczema and atopic eczema, as well as herpes and aphtha.

Preferred cosmetic and pharmaceutical areas of use are disinfection of skin, skin cleansing, sore and wound cleansing, as shampoos, soap, shower gels, softening preparations as well as peeling agents having antimicrobial effect, as skin preparations having antimicrobial effect intended to treat insect bites, as sun protection in combination with sunprotection agents or "after sun lotions". The composition may also be included as an additive in other cleansers and disinfecting agents to strengthen and widen the antimicrobial effects.

A composition for cosmetic or medical use according to the invention contains preferably 0.12-40 percent in weight low molecular carboxylic acid and 0.38-91 percent by weight diol.

Furthermore usual additives and vehicles used in cosmetics and medicine may also be included such as, for example water, C_2-C_8-alcohols, polyalkylene glycols, oils with or without emulsifying agents, surfactants, antimycotics, antiviral agents, antibac-

terial agents, sulphur and sulphur compounds, glucocorticoids, gels and enzymes.

Urea may also be included in an amount of 1-20 percent by weight and thus thereby strengthen the penetration of the active substances or the effect of added enzyme.

A product containing the above defined carboxylic acids and C_3-C_{10}-diols passes the durability (shelf life) demands which are set by the authorities concerned and thus does not need the addition of preservatives. This means, for example, that use of a shampoo according to the invention fulfills the recommendations of the Swedish Society for the Conservation of Nature (Svenska Naturskyddsföreningen) for "good environmental choice". By means of the combination of carboxylic acid-diol, antimicrobial effect may be achieved with low concentrations of the diols included, which lessens the risk of side effects. This is especially favourable when the diol is used in dematological vehicles. A combination of carboxylic acid and a diol gives a stable, homogeneous and lasting mixture, which is almost odour-free and also may be used as an aerosol. The components form stable solutions with water, ethyl alcohol and polyethylene glycols. Solutions containing propylene glycol, lactic acid, polyethylene glycol, urea and glycerol have been durability tested (shelf life tested) and have shown themselves to be durable for 3 years.

Surface treatment

The composition according to the invention, preferably in the form of a mixture of diol and low molecular carboxylic acid, may be used for treatment, cleansing and disinfecting different surfaces, mainly biological material, such as leather, skin, wood, but also plastic, metal and ceramic materials.

Cleaning agents according to the invention differ from previously known cleaning agents and disinfecting agents containing, for example, ethyl alcohol and isopropanol, because they are both emollient and non-desiccating. Small skin cracks due to dryness

of the skin often appear after cleansing with other disinfecting agents. Cleansing agents according to the invention have not caused skin cracks or drying out of the skin in the tests carried out. If the composition is used for the skin the effect works in two ways. Firstly, the infected horny layer (keratin) is removed in a mechanical way because both the components included have peeling-effects, which reduce the antigen. This reduced antigen may subsequently be killed by the antimicrobial effect of the composition.

Since the composition according to the invention is not volatile as ethyl alcohol it evaporates more slowly from the surface and therefor remains on and keeps its disinfecting effect for a longer time. From the fire-risk point of view the composition has also an advantage since it is comparatively less ignitible. Due to slow evaporation there are no obvious colling effects compared to ethyl alcohol. The advantages are thus many in practical use of the invention if it is used as a cleaner for table surfaces, leather surfaces and plastic coated surfaces, e.g. dentist-chairs.

After cleaning leather and plastic an increased shine and surface finish has also been observed. Slight damage in the material has also appeared to be less obvious after treatment with the agent according to the invention. If the composition is used for wiping lacquered wood, certain types of lacquer may temporarily be dissolved on the surface. Thereafter it has been observed that previous damage in the lacquer is less obvious or invisible. These changes have been permanent. The product according to the invention may, thus, be used as an environmentally friendly and kind-to-the-skin cleansing agent and renovating agent for lacquered surfaces.

Since the composition may form an aerosol it may easily be sprayed over large areas for quicker application. Spraying may also be used for disinfection and cleansing of wrapping material, machine components, etc. or for preventing bacteria and mould

attack on certain types of foodstuffs, e.g. bread, fruit, onions, as well as flower-bulbs, tobacco and animal fodder.

Another area of use for the composition according to the invention is to dissolve bacteria deposits on different surfaces or in cables or pipes.

For surface treatment of metals the composition nay also be regarded as having rust dissolving effect in the light of what is previously known. Therefor the composition is suitable suitable as an antimicrobial effective additive in anticorrosion agents.

As an additive in lubricants and cooling mediums, for example lubricating oil and cutting fluids the antimicrobial effect of the composition may be advantageously used so that agents need not be added. By adding a buffer a suitable pH may be obtained as required.

The spraying of wood directly after sawing to inhibit the growth of surface-mould and to prevent inhalation fever in saw mill workers, is another area of use for the product according to the invention.

In one test surface-mould was inhibited on sawn up wood for 6 months by means of spraying just once with a mixture of lactic acid and propylene glycol. On the parts of the wood where the treatment did not take place, mould formation started already after 14 days.

Impregnating

The composition according to the invention has shown itself to penetrate and be absorbed well into various materials. Treatment for preventing growth of microorganisms in deeper lying structures may be carried out by impregnating. Different materials suited for impregnating with the composition are leather; textiles, e.g. nappies, occlusive bandages, incontinence aids, tampongs, sanitary towels, dressings, plasters; cloth s,

innersoles for shoes; wood and paper products, e.g. refresher napkins, disposable towels, waste paper, etc.

The invention includes also the possibility of chemically bonding the impregnating agent according to the invention to, for example, free carboxylic acid groups in different material or to polymers absorbed or adsorbed to such material, for example, textiles, wood or paper material. Examples of such absorbed or adsorbed polymer are alginic acid or an alginate. Treatment according to this method then gives an antimicrobial impregnation which bonds more quickly through alginic acid to textiles and wood fibers. Examples of the area of use for this antimicrobial impregnation are tampongs, dressings for wounds and sores, nappies, incontinence aids and innersoles.

A gel of alginic acids or alginate to which the composition according to the invention is bonded may separately also serve as a skin and wound-care treatment without being absorbed by the textile material.

The composition may also be mixed with paints where oil is included or mixed in water-based acrylic paints to prevent mould and bacterial growth, instead of toxic anti-mould agents.

One problem when impregnating wood is that the combination according to the invention is leached by water. By adding an oil, which in itself is water repellent, this problem may be reduced to some extent. An emulsifying agent then needs to be added.

The hygroscopic effects, if used correctly, may also be an advantage since they can prevent crack-formation in wood. In the treatment of wood the impregnation with polyethylene glycols is an established method to obtain swelling of woodfibers and counter-act drying out and crack formation in the wood. Polyethylene glycols have, i.a. been used to preserve the Royal Ship Wasa. One problem which may arise with long-term treatment with polyethylene glycols is mould-formation, since polyethylene

glycols do not have sufficient antimicrobial effect. Since the composition according to the invention is mixable with polyethylene glycols this new combination can prevent growth of microorganisms.

In the production of paper the risk of mould-formation is great. This is especially true of waste-paper. A further possibility of making use of the invention is, for example, to add the composition to the process water, or feed it in spray form to prevent mould-formation. Since the composition is water soluble it is easily added even to warm or cool water-systems, etc.

Summarizing, the combination of C_3-C_{10}-diols and the above defined carboxylic acids is of interest since it has strong and wide antimicrobial effects, while being kind to the skin and to different materials, without having negative environmental effects.

To prepare the cosmetic and pharmaceutical compositions for use according to the invention, the ingredients included were mixed according to generally accepted methods.

Examples of suitable preparations, which, however, shall not limit the scope, for use according to the invention are:-

Example 1

Shampoo

Lactic acid		3 g
Diol		10 g
Glycerol		5 g
Urea		4 g
Polyethylene glycol		5 g
Hydroxyethyl cellulose		0.5 g
Surfactants		30 g
Aqua pura	to	100 g

Example 2

Soap

Lactic acid		3 - 5 g
Diol		10 - 15 g
Glycerol		5 - 10 g
Polyethylene glycol		5 - 10 g
Hydroxyethyl cellulose (gel)		0.5 g
Surfactants		50 g
Aqua pura	to	100 g

Example 3

Hand cleaning agent

a)	Lactic acid		5 g
	Propylene glycol		5 g
	Hexylene glycol		10 g
	Glycerol		10 g
	Olive oil		20 g
	Surfactants		40 g
	Emulsifying agent + water	to	100 g
b)	Lactic acid		5 g
	Propylene glycol		5 g
	Hexylene glycol		10 g
	Glycerol		10 g
	Rape seed oil		20 g
	Surfactants		40 g
	Emulsifying agent + water	to	100 g

Example 4

sore-cleansing agent

a)	Lactic acid		2 g
	Propylene glycol		15 g
	Aqua pura	to	100 g
b)	Lactic acid		2 g
	Hexylene glycol		15 g
	Aqua pura	to	100 g

c)	Lactic acid		4 g
	Propylene glycol		40 g
	Aqua pura	to	100 g

Aqua pura may in examples 4a), 4b) and 4c) be replaced by diluted spirits or physiological saline. Gels, urea and enzymes may also be included.

Example 5

Skin preparation having antimicrobial effect

a)	Lactic acid		6 - 18 g
	Propylene glycol		10 - 30 g
	Hexylene glycol		10 - 30 g
	Oil/water-emulsion	to	100 g
	(or aqua pura)		
b)	Lactic acid		6 - 18 g
	Propylene glycol		10 - 30 g
	Hexylene glycol		10 - 30 g
	Urea		4 - 15 g
	Glycerol		10 g
	Oil/water-emulsion	to	100 g
	(or aqua pura)		
c)	Lactic acid		3 g
	Hexylene glycol		10 g
	Glycerol		10 g
	Oil/water-emulsion	to	100 g
	(or aqua pura)		
d)	Citric acid		3 g
	Hexylene glycol		10 g
	Glycerol		10 g
	Oil/water-emulsion	to	100 g
	(or aqua pura)		

Example 6

Mould inhibiting agent and impregnating agent for wood

a)	Acetic acid		20 - 30 g
	Propylene glycol	to	100 g
b)	Lactic acid		20 - 30 g
	Propylene glycol	to	100 g
c)	Acetic acid		20 - 30 g
	Hexylene glycol	to	100 g
d)	Lactic acid		20 - 30 g
	Hexylene glycol	to	100 g
e)	Acetic acid		10 g
	Propylene glycol		30 g
	Polyethylene glycol	to	100 g
f)	Acetic acid		10 g
	Propylene glycol		30 g
	Linseed oil	to	100 g

Example 7

Surface improving agent for lacquered surfaces

Lactic acid		10 g
Propylene glycol	to	100 g

Example 8

Surface improving anticeptic agent for leather and platic

Lactic acid		10 g
Propylene glycol		40 g
Hexylene glycol		30 g
Glycerol		10 g
Aqua pura	to	100 g

Example 9

Colouring agent having microbial effect

a)	Acetic acid		3 - 5 g
	Hexylene glycol		10 - 15 g
	Additional additives	to	100 g
b)	Acetic acid		3 - 5 g
	Propylene glycol		10 - 15 g
	Additional additives	to	100 g

Example 10

Disinfecting agent for surfaces (ex. wood, plastic, leather, skin)

a)	Acetic acid		15 g
	Hexylene glycol		70 g
	Aqua pura	to	100 g
b)	Lactic acid		15 g
	Propylene glycol		20 g
	Hexylene glycol		50 g
	Aqua pura	to	100 g
c)	Lactic acid		5 - 10 g
	Propylene glycol		5 - 10 g
	Hexylene glycol		10 - 20 g
	Aqua pura	to	100 g

Instead of aqua pura in c) ethyl alcohol or isopropanol may be used. Only c) may be used as a skin disinfecting agent.

Example 11

Impregnation agent for textiles or refreshing napkins

a)	Lactic acid		3 - 5 g
	Hexylene glycol		10 - 15 g
	Aqua pura	to	100 g

b)	Citric acid		3 - 5 g
	Hexylene glycol		10 - 15 g
	Aqua pura	to	100 g
c)	Acetic acid		3 - 5 g
	Hexylene glycol		10 - 15 g
	Aqua pura	to	100 g

The hexylene glycol in example 11 may be replaced by the same amount of propylene glycol and Aqua pura may be exchanged for physiological saline.

CLAIMS

1. A composition having hygroscopic and antimicrobial effect comprising saturated and unsaturated, straight and branched aliphatic mono-, di- and poly-carboxylic acids having up to 10 carbon atoms, araliphatic and aromatic dicarboxylic acids, oxy- and hydroxy-carboxylic acids having up to 8 carbon atoms, and the salts thereof as well as C_3-C_{10}-diols for use in cleaning, disinfecting, antimicrobial treatment, surface treatment, impregnation or for the production of antimicrobial effective biologically decomposable material.

2. A composition according to claim 1 comprising carboxylic acids and C_3-C_{10}-diols as a mixture or chemical compound in the form of an ester, polyester or polymer.

3. A composition according to claim 1 and 2, c h a r a c t - e r i s e d in that the C_3-C_{10}-diols are propylene glycol, butylene glycol, pentane diol, hexylene glycol, heptanediol, octane- diol, nonanediol or decanediol.

4. A composition according to claim 3, c h a r a c t e r - i s e d in that the carboxylic acids are formic acid, acetic acid, propionic acid, butyric acid, valeric acid, caproic acid, caprylic acid, capric acid, sorbic acid, oxalic acid, malonic acid, fumaric acid, succinic acid, glutaric acid, adipic acid, pimelic acid, oxalacetic acid, phtalic acid, glycolic acid, citric acid, lactic acid, glucuronic acid, glyceric acid, malic acid, tartaric acid, tartronic acid, hydroxybutyric acid, hydroxypropionic acid and pyruvic acid.

5. A composition according to claim 3, c h a r a c t e r - i s e d in that the carboxylic acids are acetic acid, citric acid, tartaric acid, lactic acid.

6. A composition according to claim 1, comprising at least 0.1% carboxylic acid and at least 0.1 percent by weight C_3-C_{10}-diol, preferably at least 0.1 percent by weight carboxylic acid and at least 0.15 percent by weight C_3-C_{10}-diol.

7. A composition according to claim 6, comprising 0.1-60 percent by weight carboxylic acid and 0.1-99.9 percent by weight C_3-C_{10}- diol preferably 0.1-40 percent by weight carboxylic acid and 0.15-91 percent by weight C_3-C_{10}-diol.

8. A composition according to any of the previous claims, comprising 0.12-40 percent by weight acetic acid, citric acid, tartaric acid, lactic acid and 0.38-91 percent by weight propylene glycol, butylene glycol, pentanediol and hexylene glycol.

9. A composition according to any of the previous claims comprising carboxylic acid and C_3-C_{10}-diol, wherein carboxylic acid is included in a ratio to diol in 9-40% or preferably wherein carboxylic acid and diol have a ratio to one another in the proportions 3:10, 3:7 and 2:3.

10. A composition according to any of the previous claims further comprising additives such as water, C_1-C_8-alcohols, polymers, polyalkylene glycols, preferably polyethylene glycol, oils with or without emulsifiers, surfactants, antimycotic agents, antiviral agents, antibacterial agents, sulphur and sulphur compounds, glucocorticoids, gels and enzymes.

11. A composition according to any of the previous claims further comprising urea in an amount of 1-20 percent by weight.

12. A composition according to claims 1, 2 or 10, chemically bonded to free carboxylic acid groups or polymers.

13. A composition according to claim 12, chemically bonded to alginic acid or alginate.

14. Use of a composition containing carboxylic acids and C_3-C_{10}-diols for preparing an agent for use in combatting microorganisms which attack the skin and diseases caused by these, for example eczema, herpes or aphtha.

15. Use according to claim 14 of a composition for producing an agent for the purpose of combatting Candida, Pityrosporum ovale/orbiculare, Trichophyton, Microsporum, mould fungi in particular Aspergillus, Staphylococcus, Pseudomonas, and viruses, especially herpes virus, hepatitis virus, wart virus and HIV-virus.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 95/01191

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: A01N 37/02, 37/04, 37/06, 37/34, 31/02, A61K 31/19, 31/045, 7/48, B27K 3/50, C11D 7/26, 7/60
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: A01N, A61K, B27K, C11D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CA, WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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X	Acta Dermatovener, Volume 60, 1980, Jan Faergemann et al, "Propylene Glycol in the Treatment of Tinea Versicolor" page 92 - page 93 --	1-15
X	SE 464060 B (GUNNAR SWANBECK ET AL), 4 March 1991 (04.03.91) --	1-15

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" erlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
26 January 1996	07 -02- 1996
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile N . +46 8 666 02 86	Authorized officer Gerd Strandell Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 95/01191

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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05/01/96

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05/01/96

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